



**ENGINEERING OPERATIONS COMMITTEE
MEETING MINUTES
MARCH 14, 1996, 9:00 A.M.
EXECUTIVE CONFERENCE ROOM**

Present: T. A. Coleman L. R. Brown C. J. Arnold
 D. T. Vandenberg J. D. Culp C. T. Maki
 P. A. Lynwood (P. Miller) J. W. Reincke

Guest: D. L. Smiley W. C. Turner D. L. Coleman
 G. Huber (Heritage Research Group)

OLD BUSINESS

1. Approval of the Minutes of the January 4, 1995, Meeting - J. D. Culp

Minutes of the January 4, 1996, meeting were approved as written. (The scheduled February 1, 1996, meeting was canceled.)

2. Bridge Scoping: Traffic Control Requirements - J. D. Culp

It was acknowledged that problems exist in the bridge scoping process regarding traffic control requirements. The process is still under development and refinement. Rick Smith in Maintenance is developing an extensive checklist for bridge scoping projects as part of the process improvement. It will require Lansing Design and Maintenance, who scope bridge projects, to work closely with the districts as the fine tuning continues.

ACTION: Larry Brown will take the lead along with C. J. Arnold and Tom Maki to research the current status of the bridge scoping process improvement. They will ensure the process is heading in the right direction, determine what assistance is needed, and help put the procedure together and make it work. Larry will report back to the EOC no later than the May meeting.

Design will assure that all future bridge scope verification meetings on new projects cover the traffic control issue.

NEW BUSINESS

1. Research Report R-1340, "Evaluation of the URETEK Method for Pavement Undersealing" - J. W. Reincke/D. L. Smiley

The cooperative study between District 8 and the Research Laboratory evaluated the use of URETEK 486 high density polyurethane as a method of raising and undersealing concrete pavement slabs. Three sites were selected on I-75 in Monroe County. The URETEK method improved the base support under severely cracked pavement, but not under concrete with 3.2 mm (1/8 inch) or less cracks. Where the pavement was severely faulted, the method raised the pavement and provided a temporary increase in base stability. The method had some insulating effect on the base causing differential frost heave when the adjacent lane was not undersealed. The treatment only provided a one year benefit in ride quality and support.

It is recommended that URETEK not be used as a substitute for mudjacking pavements on open-graded bases. It may be considered as an alternate on pavements with dense-graded aggregate bases. Additional limited testing is warranted to gain further experience and knowledge about the material's capabilities and limitations.

ACTION: The report is approved for implementation. NOTE: The Maintenance Division has a contract with URETEK USA, Inc. for undersealing pavements throughout the state.

2. **Research Report, Michigan State University's "Factors Affecting the Deterioration of Transverse Cracks in JRCP" - J. W. Reincke/D. L. Smiley**

Jointed Reinforced Concrete Pavement (JRCP) develop transverse cracks as the drying and thermal shrinkage of the concrete is resisted by friction forces developed with the supporting base layer. These cracks deteriorate with time and traffic loading due to loss of aggregate interlock load transfer capacity. However, unusually rapid deterioration of these cracks was observed on some recently constructed projects in Michigan, which utilized recycled concrete aggregate (RCA) and slag. This rapid crack deterioration leads to accelerated maintenance requirements and much shortened service lives. This research report describes the development, conduct and results of a laboratory investigation to determine the relative effects of selected factors on the deterioration of transverse cracks in JRCP.

The results of this test program suggest that reductions in transverse crack deterioration in JRCP can be achieved by using combinations of quality materials and structural designs that provide tight cracks, good long-term aggregate interlock that minimize differential deflections across joints and cracks and reduce total deflections at any location in the pavement structure. For example, the provision of strong foundation support was especially effective because of reductions in the magnitude of the peak and differential displacements between the slab faces. Test results also suggest that the use of slab reinforcing designs that hold the cracks more tightly closed will provide improved crack performance. Such reinforcing designs may include the use of deformed steel or increased area of steel. Reducing the tensile stresses in the steel by shortening the joint spacing or using a subbase material that minimizes the friction between the slab and the subbase layer also helps to keep cracks tight.

It is recommended that pavements made with concrete derived from RCA or slag should feature structural designs that minimize reliance on aggregate interlock in any area of the design (i.e., at joints or cracks). Appropriate structural designs might include jointed plain concrete pavements with doweled joints and panel lengths less than 5 m (16.4 ft), or pavements that use the "hinged joint" design.

Transverse crack deterioration appeared to be strongly correlated with concrete strength (presumably due to reductions in pavement stiffness and abrasion resistance that probably accompany the use of weaker concrete). Pavements made with concrete that includes relatively weak (shear strength) aggregate particles, such as slag and recycled concrete, should: a) use mix designs that provide concrete strengths that are comparable to those of concrete made with virgin aggregates; b) use structural designs that reduce pavement stresses to levels that are appropriate for the strength that will be obtained; or c) do both. Inspection of batching, placement and curing must ensure that all mixes develop the required strengths.

Dr. Snyder believes that any of the aggregates included in this study could be used in Michigan concrete paving operations if appropriate concrete mixture proportioning and structural design modifications are made. It must be remembered that the use of different concrete aggregates results in the production of concrete with widely varying physical and mechanical properties; the use of a "standard structural or concrete mixture design for all materials can not be expected to produce pavements with comparable performance. Also, shorter slab lengths require higher quality materials to reduce the occurrence of D-cracking and premature deterioration/failure at each joint.

ACTION: Accept the report and distribute. Assign the Pavement Selection Review Committee the responsibility to develop an action plan for implementing the

report's conclusions and recommendations. This action will occur in conjunction with current partnering discussions with the Michigan Concrete Pavers Association and the Michigan Mineral Resource Association.

The Design Division (Bil Turner) will continue to look at other alternate approaches to concrete pavement design and will identify applications that justify the use of premium materials and designs.

3. **Five Reports From the Intelligent Transportation Systems (ITS) Research Center of Excellence Projects - J. D. Culp**

- A. **"Baseline Requirements for Lane Sensing to Avoid Run-off-Road Accidents"**
- B. **"Obstacle Avoidance Maneuvers in an Automobile Simulator"**
- C. **"Review of the Literature on Obstacle Avoidance Maneuvers: Braking Versus Steering"**
- D. **"The University of Michigan ITS Deployment Exercise Summary Report"**
- E. **The University of Michigan's Transportation Research Institute Report, "Smart Cruise Platform"**

The five research projects were conducted through the ITS Research Center of Excellence at the University of Michigan. The center is a program of collaborative efforts for the advancement and application of ITS technologies. The project summaries were submitted for information only.

The information from the center was accepted and the reports will be distributed by the Traffic and Safety Division.

4. **Final Consultant Report Executive Summary, "Safety Issues and Operational Treatments for Tight Diamond Ramps With Intersection Sight Distance Problems" - J. D. Culp**

Our freeway system has a significant number of diamond interchanges and many have tight ramp geometries that create operational problems and safety concerns. The study makes several recommendations that need to be addressed by the Traffic and Safety Division before the EOC can approve the report.

ACTION: The report is being returned to the Traffic and Safety Division for development of an action plan on how to resolve the problems along with specific recommendations on the recommended "fixes". An implementation time frame must be established. (NOTE: Any information that can be utilized immediately should be sent to the districts for their action.) The report and the above action items will be returned to the EOC by the July meeting.

5. **Light Emitting Diode (LED) Lights - J. D. Culp**

The traffic control industry in Michigan and throughout the nation is promoting the use of a new barricade light that uses LED technology. This technology is developing rapidly and proposes to replace the incandescent lamps with similar intensity and angularity properties. The advantage lies in an extended battery life that produces a real cost savings for the contractor and eventually MDOT.

Preliminary review and evaluation indicates the device as tested (over a year ago) does not have the angularity of an incandescent lamp. This technology continues to change and the primary LED manufacturer, Hewlett-Packard, claims that the next generation LED (due in July 1996) will meet or exceed incandescents for both angularity and intensity. Battery life is expected to last for the entire construction season.

It is proposed that the LED device be allowed as an alternate to the incandescent light only on new projects where hi-intensity sheeting is also required on Type II barricades. LED lights and hi-intensity sheeting are a systems approach to construction zone delineation.

ACTION: The EOC agrees with this recommendation and the devices will be used on selected projects under a variety of conditions - urban, rural, and in-between. The Construction and Traffic and Safety Divisions will take the lead in preparing the necessary documents to accomplish this, including the evaluation criteria as well as the physical and environmental factors that will be used to evaluate LED light performance. The evaluations will be conducted by project personnel, and the Construction Zone Review Team will also conduct separate evaluations under a variety of conditions.

The Construction Division will update the EOC as necessary, and will formally report on the evaluation of LEDs following the 1996 construction season.

6. **Superpave Binder Specifications - G. Huber/D. L. Coleman**

The Bituminous Advisory Committee (BAC) submitted a recommendation to implement the new Superpave (asphalt binder) specifications on a statewide basis by January 1, 1997. The SHRP binder selection criteria are very complicated and are based on the projected temperature of the pavement at the project site. The criteria could require specifying an unreasonable number of grades of binder. This became an issue of concern and resulted in an investigative research project where MDOT installed air and pavement temperature

sensors at 12 statewide locations. After two years of data collection, it appears that the Superpave assumptions are not correct.

To assist the EOC in their understanding of Superpave, Mr. Gerald Huber of the Heritage Research Group (formerly with SHRP) gave an informative overview on implementing the Superpave asphalt binder specification as it relates to our situation and our own temperature collection data.

The BAC recommends, as a design guide for implementing asphalt binder specifications, using the following three performance grades:

- A. Upper Peninsula, West of M-94 - Call for **PG 52-34**.
- B. Upper Peninsula, East of M-94, and
Lower Peninsula, North of M-72 - Call for **PG 52-28**.
- C. Lower Peninsula, South of M-72 - Call for **PG 58-28**.

ACTION: Approve the modifications to the asphalt binder specification and direct the Design Division to begin using the guideline for all projects to be let after January 1, 1997, or when the 1996 Standard Specifications are implemented. A memo outlining exceptions to this application will be sent from the Bituminous Advisory Committee to the Design Division.

(Signed Copy on File at M&T)

Jon W. Reincke for Calvin Roberts, Secretary
Engineering Operations Committee

Attachments

cc: EOC Members
District Engineers

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